
Application Bulletin

Of interest to: Effluent treatment plants
Chemical and process engineering

H 1

Checking the condition of platinum and gold electrodes used for redox potential measurements

Summary

Data is given for checking the condition of electrodes used for redox potential measurements. Their potentials can be verified by means of Metrohm's ready-to-use redox standard solution. A second possibility is to perform the potential measurement in a buffer solution saturated with quinhydrone and compare the measured value with theoretical values given in literature.

It is advisable to check the redox electrode assemblies at regular intervals. For this purpose, certified buffer solutions with specified redox potential or pH value should be used.

Method A

Check the electrode with Metrohm's certified ready-to-use redox standard solution (6.2306.020).

This standard yields a redox potential of $U = +250 \text{ mV} \pm 5 \text{ mV}$ at $20 \text{ }^\circ\text{C}$ [against reference system $\text{Ag}/\text{AgCl}/c(\text{KCl}) = 3 \text{ mol/L}$].

Method B

A saturated solution of quinhydrone in acidic or neutral (but not alkaline) buffer solutions represents a well-defined redox system.

Reagents

- Ultrapure quinhydrone
- Buffer solution pH = 7.00 (6.2307.110) or/and pH = 4.00 (6.2307.100)

Procedure

Mix the buffer solution with a little ultrapure quinhydrone and shake briefly until saturation is attained; some excess undissolved quinhydrone must remain. Immerse the electrode assembly being checked in the solution, measure the potential and compare it with the calculated theoretical values from the table.

Should deviations from the theoretical value of more than ± 5 mV occur, then the potential of the reference electrode used must first be measured against a second reference electrode known to be reliable. The reference electrode being tested is OK if the measured potential is zero.

A precious metal electrode that yields an erroneous potential must be contaminated in some way. Directions for cleaning such electrodes are given in the corresponding instructions for use and monographs.

The potential of an electrode assembly in a buffer solution saturated with quinhydrone should correspond with the values given in the following tables:

Metrohm buffer saturated with quinhydrone	t [°C]	U [mV]
pH = 4	5	+273.2
	15	+264.9
	20	+260.8
	25	+266.1
	30	+252.0

Metrohm buffer saturated with quinhydrone	t [°C]	U [mV]
pH = 7	5	+102.7
	15	+90.5
	20	+84.6
	25	+78.6
	30	+72.2

The potential of the reference system Ag/AgCl has been taken into account. It is assumed that the electrode is filled with $c(\text{KCl}) = 3$ mol/L.